Turkey's trilemma trade-offs: is there a role for reserves?

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26. August 2011

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October 5, 2011

Abstract

In this paper, we study the trilemma configuration of the Turkish economy. The paper starts by empirically testing the Mundell-Fleming theoretical concept of an "impossible trinity" (trilemma) for Turkey, following the Aizenman, Chinn and Ito (ACI) approach. This includes calculating the trilemma indices and investigating their evolution over the period of 1998Q1-2010Q4, which is split into three sub-samples according to the Turkey's macroeconomic policies. We also introduce alternative empirical techniques in order to deal with possible misspecification problems detected in the ACI approach. These techniques include employing additional terms in the regression, Two Stage Least Squares, General Method of Moments and Kalman filtering. The analysis supports the conclusion that the trilemma trade-offs are binding for Turkey for each sub-period. Besides, it shows how contributions of financial integration and monetary independence have increased from the first period to the last, with corresponding limitations on exchange rate stability. The analysis continues by exploring the implications of changes in the trilemma indices for macroeconomic outcomes. Accordingly, it reveals evidence that financial integration and monetary autonomy together with corresponding loss of exchange rate stability have impacts on growth volatility, inflation and inflation volatility throughout 1998-2010, though these effects might differ for each sub-period. Finally, it finds that there is a key role for raising international reserves as trilemma trade-offs and their effects on macroeconomic variables have been mitigated with their accumulation

* This paper is based on part of the PhD dissertation of the first author, submitted at UCSC. We are grateful to Carl Walsh for helpful comments and discussions.
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1. Introduction

The macroeconomic policy "trilemma" for open economies, also known as the impossible trinity, states that a country simultaneously may choose at most two of the following three goals: monetary independence (MI), exchange rate stability (ES) and capital account openness (KO). The trilemma policy trade-offs are conveniently represented via a triangle, where each side of the triangle in Figure 1 represents full attainment of one of the three goals. Therefore, as shown, being at any vertex of the triangle represents full attainment of two of the three goals, at the expense of abandonment of the third.

Clearly, an economy cannot be positioned on all three sides of the Figure 1 triangle at once. However, since each of the three goals is potentially desirable, it is conceivable that policy makers would attempt to meet all three partially, which is captured in Figure 1 as being at a point somewhere in the interior of the triangle.[1] For example, a country might have a managed float and some capital controls, sacrificing some monetary independence as well in the face of international capital flows.

In fact, the partial attainment of all three policy goals has seemed to characterize policy-making in practice, and has perhaps even been the dominant global policy stance, especially for emerging market economies. This "mixed" approach to the trilemma has been characterized by continual adjustment of policies in response to a rapidly changing global environment, as well as attempts to implement market-oriented economic reforms. At the same time, government policy makers have not always had clear guidance on how precisely to manage the trade-offs: in terms of Figure 1, what is the optimal position in the triangle at any given time? Or, even more fundamentally, what are the joint implications of a complex

[1] See Aizenman (2010), for example, for a more detailed discussion of the trilemma framework.

set of macroeconomic policy decisions for the policy stance of an economy, viewed from the lens of trilemma trade-offs? Can a country's policy-makers even know where they are positioned in the triangle?

Therefore, it is important to have a better understanding of how to characterize and measure various different mixtures of trilemma policy stances, and the present paper contributes to an emerging literature in this area. The underlying theoretical framework of the trilemma, namely the Mundell-Fleming model, is not very easily adapted to analyzing the partial attainment of all three goals in formal theoretical modeling. However, Aizenman, Chinn and Ito (ACI) recently developed a new methodology to empirically characterize the mixed approach to the trilemma in practical policy-making. In their approach, ACI (2008, 2010) initially measure each policy dimension via an empirical index. A higher value of one index represents greater closeness to that policy goal. In this case, the question of how trilemma-based policy trade-offs are managed becomes an empirical exercise.

The theoretical constraint of trade-offs between the three policy goals is then captured by estimating a regression equation in which the dependent variable is a constant (in their case, one), and the independent variables are the three trilemma indices (with the constant term excluded on the right hand side, of course). However, in this regression, the estimated coefficients alone will not provide sufficient information about "how much of" the policy choice countries have actually implemented even though they should give us some approximate estimates of the weights countries put on the three policy goals. Hence, following ACI, looking into the contributions using the estimated coefficients and the actual values for the variables (such as a*MI , b*ES , and c*KO) will be more informative. The coefficients multiplied by the values of the indices therefore indicate the ***relative contributions*** of the three variables to the overall trilemma policy stance.

The ACI methodology is applied by them to large cross-sections and time-averaged panels of countries, in order to discern patterns of trilemma policy stances in different groups of countries, and at different points

in time. That particular data analysis reveals how, for example, emerging market economies have adjusted to managing the trilemma as they have opened their economies while facing potentially severe global shocks. The ACI methodology provides an important new empirical approach to understanding the evolution of the global financial architecture and policy responses.

Cross-country analysis can also be useful for individual country policy-makers, if they believe that they can draw lessons from "average" experience across a relevant comparison group, but it will typically not be sufficient for understanding a single country's past policy choices and future policy options. Our focus in this paper is therefore on applying the ACI methodology to a single country, Turkey, with the objective of more specifically understanding the detailed evolution of the policy stance toward the trilemma trade-offs. Our analysis can provide policy-makers with a summary view of their past choices, including unintended consequences or unappreciated trade-offs, as well as serving as an input into analysis of future policy options.

Our focus on Turkey is driven by its relatively challenging experiences as an emerging market economy, including struggles with inflation, exchange rate management, and policies of financial liberalization. Besides, Turkey is a candidate country for European Union membership, and hence has to fulfill the Maastricht criteria. With this perspective, the resulting potential future impacts on macroeconomic policy making can be informed by a better understanding of how it has managed the trilemma trade-offs in the recent past.

Our single-country paper is similar to Hutchison, Sengupta and Singh (2010) who have applied the ACI methodology to India. However, we differ from them by testing the ACI methodology in terms of checking specification errors and searching for consistent contribution figures. This is because, potentially, running a regression with a constant on the left hand side may imply that the independent variables are correlated with the residuals, as we force the residuals and the weighted sum of the variables

to add up to a constant. Such correlation would cause OLS coefficient estimates to be biased and inconsistent. In this context, we initially perform a specification test i.e. the Ramsey RESET test, to check the specification of the regression. Next, we attempt to eliminate such a misspecification found in the OLS analysis by employing different techniques; two stage least squares (TSLS), general method of moments (GMM), and Kalman filtering. While no single estimation method can be considered definitive, our approach here allows us to examine the robustness of the estimated contributions across different estimation methods, each with its own assumptions about the underlying structure of the relationship between the trilemma indices and associated policy stances. In our analysis, however, the results obtained from Kalman filter analysis appear to be the most consistent with the actual behavior of the Turkish economy over the period considered.

An important additional feature of the ACI analysis has been to apply their empirical approach to assessing the role of foreign exchange reserves in softening (at least in the short run) the trade-offs inherent in the trilemma. Thus, this paper, following ACI again, specifically assesses the empirical role of reserves in modifying the trilemma trade-offs in practice for Turkey. The role of international reserves has also been discussed widely both in the literature and by central bankers. Central bankers of emerging markets usually assign reserves a buffer role against risks after experiencing several crises in a financially integrated environment. The reserves to GDP ratios in many emerging market economies increased dramatically after the East Asian crisis of 1997-98. Similarly, Turkey's reserve accumulation presented in Figure 2 indicates a substantial increase in international reserves over the last decade. Regarding empirical studies, several of them (e.g., Cheung and Ito, 2007; Obstfeld, et al. 2008) suggest structural changes in the patterns of reserves hoarding. Obstfeld, et al. (2008) also find that financial openness, the ability to access foreign currency through debt markets, and exchange rate policy are all significant predictors of international reserve stocks.

The paper proceeds as follows: Section 2 gives a brief description of Turkish macroeconomic policies during 1998-2010. Section 3 describes the methodology and the dataset used in this study. Section 4 and 5 conduct the econometric analysis and report the results on the trilemma-influenced policy configuration over the period analyzed. Section 6 investigates macroeconomic impacts of the trilemma policy configuration, including the role of foreign exchange reserves. Lastly, Section 7 presents the conclusions.

2 Dealing with the Trilemma Trade-offs after Liberalization: Turkish Case

Liberalization of the Turkish economy started in the early 1980s with economic policies designed to encourage exports. This was followed by the liberalization of the foreign exchange regime early in 1984, allowing commercial banks to accept foreign currency deposits. In parallel to those changes, an interbank money market for short term borrowing facilities was enacted in 1986 and the Turkish Central Bank started its open market operations in 1987. Additionally, the Turkish Capital Market Board was established which later on initiated the opening of Istanbul Stock Exchange during the same period. Finally, with the recognition of full convertibility of the Turkish Lira and full liberalization of the capital account, financial liberalization was effectively completed in 1989.

Two decades of experience after liberalization have provided a basis for examination of Turkish economic policies with regards to the trilemma trade-offs. Since 1989 when Turkey became financially liberalized, the Turkish economy could not manage to achieve a solid economic performance at all times. In fact, two serious exchange rate crises hit the economy, in 1994 and in 2001, due to the vulnerability caused by financial liberalization and accompanying high current account and budget deficits. In the first crisis of 1994, the Turkish currency devalued by nearly 40 percent. With the later crisis, the devaluation rate reached 100 percent and the Turkish economy had to change its strategy in dealing with the trilemma trade-offs. Before 2001, exchange rate stabilization (via pegged exchange rate regimes) was crucial for

the Turkish economy. However, after 2001, monetary independence took this place as the key policy goal, as the exchange rate was allowed to float freely. Hence, we next examine macroeconomic policy implementations of Turkey in two main periods: the pre-2001 period and the period from 2001 till today.

2.1. Pre-2001 Period

In terms of macroeconomic policies, the pre-2001 period can be further categorized into three sub-periods: pre-1980s, 1980-1988 and 1989-2001. In the pre-1980 period, international capital movements were severely restricted. Thus, there were not any partial policy trade-offs in this period, as Turkey could control both the exchange rate and interest rates in the absence of financial integration – it was at a vertex of the trilemma triangle.

The decade of the 1980s (more specifically, the 1980-1988 period) was the transition period for the liberalization of Turkish economy. In this period, the controls over foreign exchange transactions were removed in a gradual manner. However, there were still some restrictions on capital transactions in this decade; hence it was possible for the Turkey to implement a pegged exchange rate regime and also to control interest rates simultaneously.

Finally, with the recognition of full convertibility of the Turkish Lira in 1989, Turkey removed all controls over foreign exchange transactions. Thus, it initially faced the trilemma trade-offs in 1989 after having fully liberalized its capital account movements. Subsequently, Turkey made its choice and continued to implement the pegged exchange rate regime and (slowly) gave up controlling interest rates till 2001.

After the completion of capital account liberalization in 1989, there has been a relatively massive short term capital inflow -- rather than long term -- to Turkey whereas long term inflows including direct

investment remained limited[2]. Given the lack of deep domestic financial markets, the productive sectors of the economy were harmed in an environment dominated by large movements of short-term capital, high interest rates, an overvalued currency and stagnant export markets. The situation was worsened because the Turkish government was not 'fiscally disciplined' enough and unable to meet its budget and had to borrow from the domestic market at high interest rates. As a result, Turkey's macroeconomic performance soon became dependent on short-term capital inflows and Turkey lived through chronic fiscal imbalances and a high and chronic inflation. In order to overcome inflation and to achieve macroeconomic stability, Turkey has launched many stabilization programs, at the center of which lay the pegged exchange rate regime. However, as most of the exchange rate based stabilization programs were either interrupted or stopped, Turkey could achieve neither price stability nor high and sustainable growth rates. Therefore, the economy remained vulnerable to a vicious circle of bad macroeconomic performance causing costly capital inflows generating, in turn, higher public deficits (Central Bank of the Republic of Turkey, 2004).

On account of this risky position, Turkey experienced two severe crises, in 1994 and 2001, each of which ended with large devaluations, higher inflation rates and economic recessions. Besides, contagion effects of the Asian and Russian crises in 1997 and in 1998 increased the vulnerability of the economy. Living with such weaknesses for such a long period of time created a strong inertia in inflation dynamics and high volatility in growth rates. As a consequence, Turkey's inflation averaged over 70 percent in the period 1989 to 2001 while growth rates remained at a level of 3 percent on average.

As the economy has been trapped into high real interest rates together with an overvalued domestic currency, the monetary authority was bound to a passive role in this period. Hence, the Central Bank of

[2] The level of FDI inflows remained stable in Turkey in the 1990s, while FDI surged over the world. For Turkey, FDI increased in the 1980s following the liberalization measures implemented at the beginning of the decade, but growth in FDI stopped in the 1990s, with inflows averaging less than 0.5% of GDP. In the same time, Central European countries, which are considered as Turkey's main competitor in the region for attracting foreign investment, scored much higher inflows (OECD reviews of Regularity Reform in Turkey, 2002).

the Republic of Turkey (CBRT) has been forced to hold significant foreign exchange reserves in order to accommodate to this process (Balkan and Yeldan, 2002). In line with this, Central Bank reserves reached 25 billion USD at the end of the 1990s starting from 5 billion USD in the beginning of the decade. In spite of this hoarding, Central Bank's reserves were not sufficient to defend the Turkish Lira in the crisis of 2001. Even though Central Bank reserves spent 25 percent of its reserves in this crisis, the Turkish Lira depreciated by 40 percent due to the huge short term capital outflows. In fact, net portfolio capital outflows exceed 5 billion USD in just one quarter before this crisis. This is a huge outflow for Turkey as net portfolio investment flows stayed positive throughout the decade attaining an average of 1.5 billion USD per year[3].

2.2. Post 2001 Period

The 2001 crisis was an important watershed for the Turkish economy as it made clear that the pegged exchange rate regime was impossible to carry out due to the loss of confidence of economic agents in the sustainability of such a regime. Hence, on 22nd February of 2001, the Turkish Lira was allowed to float freely in order to prevent further damage to the economy. Accordingly, the Central Bank would intervene in the market only to compensate for the short-term excess volatility in the exchange rates in either direction. In practice, Central Bank carried out several interventions in the period of 2002–2006 amounting to a total of 27.5 billion USD. As presented in Table 1, a big portion of these interventions (around 25.5 billion USD) was in the form of foreign exchange purchases. As a result of this, Central Bank reserves rose from 20 billion USD to the level of 60 billion USD in just 5 years.

By implementing a floating exchange rate regime, Turkish Central Bank has gained an active role after 2001 in achieving price stability, thus a new monetary policy strategy, namely an inflation targeting (IT) regime, was designed. This regime was implemented implicitly during the period between 2002-2005 and

[3] Only exception is the year of 1998 when there was net portfolio investment outflow 6.7 billion USD. This was mainly a contagion effect of the Russian crisis.

explicitly thereafter. Under the inflation targeting regime, the Central Bank began to use its interest rate instrument, effectively indicating a significant move in positioning within the trilemma triangle. Thus, during this period, the CBRT faced the traditional trilemma problem of maintaining an independent monetary policy in the face of international capital inflows and a desire to stabilize the exchange rate.

With these new policies, the Turkish economy has entered into a structural transformation process through which macro economic performance has improved considerably. In the period of 2002 - 2005, all inflation targets have been attained for four years in a row and the inflation rate was brought down to single digits, where it stayed thereafter. This performance in disinflation positively affected economic growth. Not only positive but also high growth rates were attained. Total cumulative economic growth in real terms surpassed 30 percent from 2002 to 2006.

In parallel to these macroeconomic improvements, the economy started witnessing sharp increases in capital inflows, especially in the years prior to the recent global financial crisis. Both net foreign direct (FDI) investment and net portfolio investment inflows rose to a larger extent. Between 2002 and 2007, net FDI inflows grew constantly and peaked at 20 billion USD level. On the other hand, net portfolio inflows continued to fluctuate even tough these inflows attained an average over 5 billion USD each year during the same period.

Recently, with the beginning of the global financial crisis, the outlook of the economy changed somewhat as Turkey suffered from its spillover effects like most emerging market economies. Nevertheless, the Turkish economy has been one of the first to recover from the crisis in 2010. In the meantime, the inflation rate was kept in single digits despite the external shocks experienced during 2008-2010. On the other hand, keeping inflation low had some contractionary effects on economic growth during 2008-2009. Turkish GDP initially stabilized in 2008 and shrank later in 2009. The slowdown of the economy did not

long last and Turkish economy recovered starting from the last quarter of 2009 and achieved a high growth of around 9 percent in 2010.

These growth prospects have been accompanied by fluctuating capital flows. While FDI continued to remain strong with 15.7 billion USD in 2008 and 6.7 billion USD in 2009, net portfolio outflows amounted to roughly US$10 billion just in three quarters of 2008 Q3-2009Q1. This led to depreciation pressures and higher volatility in the foreign exchange market. However, even in the event of such large capital outflows, CBRT did not undertake foreign exchange intervention measures to limit pressures on domestic liquidity. As a result, the rapid reserve accumulation of 2002- 2006 has slowed down after 2006 and Central Bank reserves reached a total of 70 billion USD in 2009 by increasing 10 billion USD since 2006. In contrast, capital inflows and net portfolio investments have gone up by US $15 billion just in 2010, boosting foreign exchange reserves another 10 billion USD during the year.

3 Data

Our approach to of constructing the trilemma indices mainly follows Aizenman, Chinn and Ito (2008, 2010) in terms. Hence, we initially construct indices for each of the three policy objectives of the trilemma: monetary independence, exchange rate stability and capital account openness (or financial integration). Nevertheless, our study has two departures from Aizenman, Chinn and Ito (ACI). First of all, instead of using cross-country data and time-averages of annual data, we use data for a single country, Turkey. Secondly, we use a different measure of capital account openness than the preceding authors, this last departure being dictated by the needs of a time series analysis of trilemma policy stances. In this respect, our study follows Hutchison, Sengupta and Singh (2011).

The data we employ, being quarterly, is higher in frequency than employed by ACI, and subject to substantial time variation. Indeed, we find that there is variation in the results across three sub-periods

into which we divide our sample. The division into sub-periods is determined by changes in the institutional regime that was in force in the different sub-periods.

The main data constraint in this work is related with the capital openness. Firstly, quarterly data for capital flows is available starting from 1992. Nevertheless, since we describe capital openness as a ratio over GDP in the next subsection, our data extends from 1998Q1 to 2010Q4, covering 52 quarters. The reason for losing the period of 1992 to 1998 is mainly because the up-to-date GDP series for Turkey starts from 1998. However, the previous series covering the period of 1987 to 2007 is also used for robustness and cross checks.

For composing the trilemma indices, we obtain quarterly data on GDP, exchange rate, interest rates and capital flows from the CBRT website. We use the nominal Lira-to-US dollar exchange rate series to construct a quarterly index of exchange rate stability, as described in the next subsection. For calculating the monetary independence index, we use interbank overnight interest rates for Turkey and for the US. For the latter, we use Federal fund rates which we obtain from Federal Reserve System database. The correlations between these two are used to create a quarterly index of monetary independence, again as described in the next subsection. To examine the impact of international reserves, we again use data from the CBRT website where the data is weekly. We average reserves figures for each quarter to construct a quarterly series for international reserves of Turkey[4].

The policy outcomes we examine are growth volatility, inflation and inflation volatility. For growth volatility, we employ the industrial production index (IPI) as output data is not available for sufficiently

[4]Since reserves are a stock, and GDP is a flow, one can calculate the reserves-to-GDP ratio using quarterly data after annualizing the GDP figure by multiplying it by four. However, this will not change any of our results in our analysis.

high frequencies to allow construction of a quarterly growth volatility series[5]. For two other measures, we use the monthly CPI index, again from the CBRT database. The inflation series is quarterly averages of monthly inflation figures. For inflation and growth volatility series, the standard deviation of two sequential quarter's inflation and IPI series are calculated.

3.1 Construction of Indices

The key constructs for examining the policy configuration with respect to the trilemma are indices of monetary independence (MI), exchange rate stability (ES) and capital account openness (KO). These indices are constructed as follows.

ES Index

Following ACI (2008), we construct this index by calculating the quarterly standard deviations of the change in the log of the Lira-US dollar exchange rate, and the index is then constructed according to the formula below:

$$\frac{0.01}{0.01 + stdev(\Delta(\log(exch\_rate))}$$

Again, the scaling ensures that the index lies between 0 and 1, with the highest value indicating the greatest degree of exchange rate stability. In the calculation of this index, we depart from ACI (2008) by employing daily series in order to be more precise. The evolution of this index for the sample period is shown in Figure 3.

MI Index

We again follow Aizenman, Chinn and Ito (2008) in measuring MI as the reciprocal of the correlation of interest rates in the home country (here Turkey) and the base country (here the United States). Quarterly correlations are calculated using daily interest rate data whereas ACI (2008) used monthly interest rates.

[5] Two different industrial production series are used in our regressions to cover the whole period of 1998-2010. The first series lies between 1997-2008 while second one starts from 2005 and continues to up to date.

As mentioned earlier, the interest rates are overnight interbank rates. The formula used for constructing this index is:

$$MI = 1 - \frac{corr(i_H, i_B) - (-1)}{1 - (-1)}$$

The scaling ensures that the index lies between 0 and 1, with the highest value indicating the greatest degree of monetary independence. The plot of the MI index is shown in Figure 4.

KO Index

For construction of the KO index, we use simple de facto measure of capital account openness, using the ratio of the sum of inward and outward foreign investment flows to GDP following Hutchison, Sengupta and Singh (2010)[6]. However, a critical point should be noted at this stage is that the KO index is not theoretically constrained to lie between 0 and 1 – the upper bound cannot be imposed. However, for the sample period, it is easily met as shown in Figure 5.

The lack of data with sufficient frequency on de jure controls dictates our approach. Admittedly, de facto capital openness is not only driven by de jure restrictions on capital flows but also those on current account transactions, export proceeds or exchange rates. In fact, the incorporation of these additional items focuses on the *extensity* of capital controls as they refer to the existence of different types of restrictions rather than to the stringency of restrictions on cross-border transactions. However, this can still proxy for the intensity of the capital controls. Within this context, a country like Turkey, while having an open capital account, may still restrict the flow of capital by limiting transactions on the current account or controlling exchange transactions. Taxing imports for some specific goods and a restricted exchange rate regime are examples of these kind of restrictions that Turkey implemented from time to time during 1998-2010. In our

[6] Aizenman, Chinn and Ito use the Chinn-Ito index.

empirical analysis, we pay particular attention to the problem of possible measurement error in our capital openness index.

3.3.3 Dividing into Sub-periods

We divide the entire period into sub-periods as the period under consideration covers dramatic changes in external conditions and policy stances. Doing so will allow us to see how policy differences affected the trilemma configuration in different sub-periods.

While dividing the whole sample into sub periods, our main focus is the exchange rate policies of Turkey. As described earlier, Turkey switched from the pegged exchange rate regime to floating in the first quarter of 2001. After allowing Turkish currency to float freely after 2001Q1, Turkey experienced the famous concept of fear of floating as Turkey continued to intervene to the foreign exchange markets. This continued till 2006Q2 as shown in Table 1. Hence, in the period of 2001Q2 to 2006Q2, CBRT has intervened to the foreign exchange market from time to time. After 2006Q2, Turkey has not performed any interventions in the foreign exchange market. Accordingly, we choose 2001Q2 and 2006Q2 as critical episodes in splitting the whole period into three.

4 In Search of Consistent Contribution Estimates

Our methodology to analyzing Turkey's macroeconomic policies in the context of trilemma trade-offs again follows Aizenman, Chinn and Ito (2008, 2010) but with cross-checks by employing other econometric techniques, to explore the robustness of particular estimation methods. We initially estimate a model for the trilemma configuration that is revealed by the data, by regressing a constant on the three indices. We replicate this with other techniques in order to reach a method in which specification is attained correctly. Thus, apart from OLS, we employ different techniques, both linear and non-linear, in order to obtain consistent index contribution figures. Finally, we also examine the role of international

reserves accumulation in affecting policy outcomes, through the interaction of reserves with the trilemma configuration.

4.1 Methodology

Following ACI (2008), we initially test the validity of this possible trilemma in a linear tradeoff for each sub-period. This reduces to examining the goodness of fit of this linear regression[7]:

$$2 = aMI_t + bES_t + cKO_t + \varepsilon_t \qquad \textbf{(1)}$$

The contributions obtained from equation (1) for the subsamples are reported in Table 2. This table reports the means, coefficients and contributions of the three indices for all three periods and R-squared figures. The overall fit is extremely good, reflected in the very high R-squared numbers.

Furthermore, we also examine the robustness of the contribution estimates as the basic analysis may possess specification problems. Ramsey and Alexander (1984) showed that the **Ramsey Regression Equation Specification Error Test (**RESET) test could detect specification error in an equation which nonetheless gives satisfactory values for traditional test criteria (goodness of fit, high t-ratios etc). Thus, as a next step in our analysis, we test our OLS analysis by performing the Ramsey RESET test, in order to see whether specification errors exist or not.

4.2 Testing the Specification: Ramsey RESET Test

The Ramsey RESET test developed by Ramsey (1969) is a general specification test for the linear regression models. More specifically, it tests whether non-linear combinations of the explanatory variables have any power in explaining the endogenous variable. Technically, Ramsey (1969) proposed

[7] For this regression, we detect heteroskedasticity and autocorrelation in our robustness checks in several cases, even though the significance of our coefficients is affected only in a limited manner. Hence, we employ Newey-West standard errors in our regressions in order to be more precise and consistent in the presence of both heteroskedasticity and autocorrelation. The constant term on the left hand side of the regression is set equal to 2, since policy configurations on the vertices of the trilemma triangle would correspond to two indices equal to 1 and the third index equal to zero. Of course, this is just a normalization, and following ACI in using 1 on the left hand side would simply double the estimated coefficients.

to fit the initial regression and generate new regressors that are functions of fitted values $\mathbf{y=x\beta}$, such as $\mathbf{w= (x\beta)^2, (x\beta)^3 \ldots (x\beta)^n}$. The next step in the test is to estimate the model $\mathbf{y=x\beta+w\gamma+u}$ and the test the nonlinearity as the Wald test of *n* restrictions, H_o: $\gamma=0$ against H_a: $\gamma\neq0$. Typically a low value of 2 (or 3) is used for *n*.

In our trilemma regression, Ramsey RESET test indicates the possibility of specification error despite the attractive results. Accordingly, the OLS analysis may have at least one of the following types of specification errors:

- Omitted variables
- Incorrect functional form
- Endogeneity problem.

In all these cases, the OLS estimates become biased and inconsistent. Below, we discuss and attempt to overcome those different types of specification errors.

4.3 First Potential Problem: Omitted Variables

This problem occurs if the OLS analysis does not include all relevant variables. However, as we are constrained with three indices theoretically, we can not add any other variables into our regression. On the other hand, we can still *add* quadratic and/or cubic (or even higher power) terms of the same indices into our regression equation. This modification is therefore a special case of the incorrect functional form issue. Adding these new terms does not violate linearity in the parameters, although the expression on the right hand side becomes non-linear in the independent variables. In the rest of the paper, we name this new OLS regression obtained by adding new terms to our standard OLS as "***enhanced OLS***".

4.4 Second Potential Problem: Incorrect Functional Form

Regarding the incorrect functional form problem, the linearity assumption of OLS might have caused the specification error. To address this issue, some or all of the variables should be transformed to logs,

powers, reciprocals, or in some other way. Hence, there is a wide range of alternatives in the form of ***non-linear least squares***. However, as none of the non-linear specifications we attempt give reasonable results, we do not report these analyses performed in the context of non-linear least squares.

4.5 Third Potential Problem: Endogeneity

Endogeneity, i.e., correlation between the disturbance and explanatory variables, can arise as a result of omitted variables and measurement error.[8] Given that we deal with the omitted variables case in the previous section, here we focus on measurement error. Next, we also allow our regressions contain autocorrelated errors in order to eliminate any possible inefficiency from that source.

Measurement Error:

Measurement error occurs when the variable that theory tells us belongs in the relationship cannot be precisely measured in the available data. We are faced, therefore, with using an approximate measure, including some error of measurement. The standard approach to deal with measurement error is to estimate the equation using *instrumental variables* regression. The idea behind this approach is to find a set of variables, termed *instruments*, that are both correlated with the explanatory variables in the equation, and uncorrelated with the disturbances. These instruments are used to eliminate the correlation between right-hand side variables and the disturbances.

In our analysis, we treat the capital openness index as the variable that is measured with error. This is due to the fact that we cannot observe capital openness precisely.[9] "Net errors and omissions" item in Turkey's balance of payments amounts to non-negligible figures. Furthermore, for our time series data, we can not calculate capital openness according to the commonly used measures. Hence, our capital

[8] Simultaneity and sample selection errors and autoregression with autocorrelated errors are other problems that give rise to endogeneity.

[9] Regarding other two indices, we assume no measurement errors as exact values of both interest rates and exchange rates are observable.

openness definition (of the ratio of the sum of inward and outward foreign investment flows to GDP) is likely to depart from its true value and we need to use an instrumental variable instead of the capital openness index.

As measurement error of capital openness has no structure in our case, meaning that it is independent of the true capital openness (named as "classical measurement error"), use of lagged variables as instruments becomes legitimate. In line with this, we employ lagged capital openness index as the instrumental variable in a two stage least squares (TSLS) analysis, which is a special case of instrumental variables regression.

Autocorrelated Errors:

A common finding in time series regressions is that the residuals are correlated with their own lagged values as in our case. Unless there are also lagged dependent variables on the RHS of the regressions, autocorrelation itself does not bias the OLS coefficient estimates but they become inefficient as the standard errors tend to be underestimated. Hence, in order to attain efficiency, we replicate all our analyses with auto correlated errors of first-order lags, AR(1), as it is the simplest type of serial correlation.

5 Trilemma Contributions: Findings

In this section we assess different techniques discussed so far; OLS, enhanced OLS, TSLS, enhanced TSLS and same models with autocorrelated errors. In our assessment, our guide is the Ramsey RESET test. We employ this test in order to evaluate specifications of each model for different sub-periods in which we determine our confidence level as 95 percent.

First, we start with OLS and its autocorrelated error version. We find out that Ramsey RESET test rejects both of these specifications for any sub-periods. As they are misspecified, our contribution figures are

biased and inconsistent. This is a crucial finding as it indicates that it is misleading to apply the ACI approach for Turkey.

Next, we investigate TSLS and its autocorrelated error version. TSLS regression itself is confirmed by Ramsey RESET test for the first period of 1998Q1-2001Q1 while its first-order autocorrelated error version is confirmed for the last period of 2006Q3-2010Q4. For the middle period of 2001Q2-2006Q2 and for the whole period of 1998Q1-2010Q4, Ramsey RESET test still indicates a specification error.

As none of these specifications are verified by Ramsey RESET test, these specifications do not constitute a common ground for making comparisons. In line with this, we enhance our trilemma regression in two dimensions in order to obtain a common specification of all sub-periods that is suitable for the Ramsey RESET test. First, we add extra terms to the trilemma regression. Secondly, we examine higher degree of autocorrelation in our regressions. Below; we discuss these two dimensions in more detail.

5.1 Obtaining Enhanced Models

In the context of the first dimension mentioned above, our search over possible specifications results in a specification which contains both squared and cubic terms of the trilemma indices. With such a specification, we follow the same steps as before and obtain more satisfactory results in terms of suitability of their specifications. Hence, results of Ramsey RESET test obtained from enhanced models differ from the previous models. In fact, we are able to obtain the verification of Ramsey RESET test for all three sub-periods for the regression of enhanced TSLS with AR(1) errors. Similarly, enhanced OLS with AR(1) errors regression is verified for the first and third periods.[10] Regarding the regressions without autocorrelated errors, namely enhanced OLS and enhanced TSLS, our specifications are again rejected by the Ramsey RESET test.[11]

[10] For 2001Q2-2006Q2, Ramsey RESET test rejects this specification at 5 percent significance level but does not reject it at 1 percent significance level.

[11] Third period of 2006Q2 -2010Q4 for enhanced TSLS regression is the only exception.

5.2 Higher order autocorrelation

With this second dimension, we allow model errors to be higher order autocorrelated and compare such specifications with our first order autocorrelated model. As autocorrelated errors do not lead to bias, only to inefficiency, this step is only to check robustness of our results and it is supportive to our earlier analysis. In this context, we run our basic OLS and TSLS regressions including AR(2), AR(3), etc. terms. An important point here is that allowing higher order autocorrelation decreases the reliability of the regressions given the low degrees of freedom especially for the enhanced models. Additionally, in most cases, regressions with first-order autocorrelation have the most suitable results with regard to the Ramsey RESET test. From this perspective, the only worthy specification is the TSLS regression that includes both first and second order autocorrelated errors. For this regression, the Ramsey RESET test does not reject its specification at the 5 percent level for periods of 1998Q1-2001Q1 and 2006Q3-2010Q4 and at the 1 percent level for 2001Q2-2006Q2.

5.3 Assessment

In Table 3 and 4, we report contributions calculated from all the regressions mentioned earlier. According to these contribution figures, we have 3 groups of results. The first group consists of OLS and OLS with first-order autocorrelated errors which are misspecified in general according to Ramsey RESET test. According to the contributions of this group, exchange rate stability is the highest contributor among the three trilemma indices. Thus, stabilizing the exchange rate has been crucial for policy makers throughout the entire period. On the other hand, the contribution of exchange rate stability has decreased in the last period, which was compensated by increased monetary independence and capital openness, reflecting the trilemma trade-off. However, contributions of monetary independence and capital openness are still limited in comparison to the contribution of exchange rate stability.

In the second group of results, we mention contributions obtained from the regressions of TSLS, TSLS with AR(1) and TSLS with both AR(1) and AR(2) errors. For the period of 1998Q1-2001Q1, this group

of results is similar to the results of the first group confirming the high contribution of exchange rate stability. During the subsequent periods, this group of results indicates a very high contribution level of capital openness whereas in some cases it surpasses even the contribution of exchange rate stability. However, this finding should be considered with caution as estimates of TSLS might be imprecise because of instrumenting, which can make the outcome highly sensitive to the chosen instrumental variable.

In the last group, we mention enhanced OLS, enhanced OLS with AR(1) errors and enhanced TSLS with AR(1) errors. These regressions indicate that in the first two periods, during 1998Q1-2006Q2, Turkey's macroeconomic policies are driven only by exchange rate stability while capital openness and monetary independence have no contribution at all. In the last period of 2006Q3-2010Q4, capital openness and monetary independence gain very limited roles although exchange rate stability still continues to dominate. In line with this, changes in contributions of the indices between periods are very small for these regressions and differences between sub-periods are negligible. This is in fact a disadvantage of adding too many extra terms into the regression as some of the coefficients become insignificant and contribution figures become imprecise.

According to the results of all three groups, exchange rate stability being the highest contributor among the three trilemma indices especially in the first and second periods is in line with Turkish macroeconomic policies in this period, experiencing a pegged exchange rate regime and the concept of fear of floating respectively. Nonetheless, apart from this common finding, the regression techniques considered in this section differ from each other with regard to their contribution figures. Hence, we continue our examination of trilemma contributions with alternative and more general techniques.

6. Introducing Alternative Techniques

In this section, we employ alternative techniques in order to check how consistent our results are in comparison to these alternatives. These additional techniques we employ are Generalized Method of

Moments (GMM) and State Space Modeling i.e. Kalman filter. In choosing these techniques, we aim to eliminate potential misspecification problems by taking our methodology into a more general framework in which OLS remains as a particular case in the analysis.

6.1. General Method of Moments (GMM)

We carry out a GMM analysis as the first alternative method in which we use MI, ES and KO indices themselves linearly and we employ their lagged values as instruments. This method requires that a certain number of moment conditions were specified for the model. These moment conditions are functions of the model parameters and the data, such that their expectation is zero at the true values of the parameters. The GMM method then minimizes a certain norm of the sample averages of the moment conditions. The main advantage of employing GMM is that it is based on minimal assumptions; requires only a partial specification of the model with fewer restrictions on the error structure. Thus, the GMM estimators don't use any extra information aside from that contained in the moment conditions and they are known to be consistent, asymptotically normal, and efficient in the class of all estimators.

The starting point of GMM estimation is a theoretical relation that the parameters should satisfy. These theoretical relationships are usually orthogonality conditions between some function of the parameters and a set of instrumental variables. The GMM estimator selects parameter estimates so that the sample correlations between the instrument and the function are as close to zero as possible. Accordingly, the ordinary least squares estimator can be viewed as a GMM estimator based upon the conditions that each of the right-hand variables is uncorrelated with the residual.

We perform our GMM analysis with *Time series (HAC)* and *Prewhitening* options. The former option enables GMM estimates to become robust to heteroskedasticity and autocorrelation of unknown form. With the second option, we "soak up" the correlation in the moment conditions by running a preliminary VAR(1) prior to estimation.

6.2 State Space Modelling: The Kalman Filter

State space modeling is a general and powerful representation. A wide range of time series models, including the classical linear regression model and ARIMA models, can be written and estimated as special cases of a state space specification. One of the main benefits of representing a dynamic system in state space form is that it allows unobserved variables to be incorporated into, and estimated along with, the observable model. Second advantage of employing state space models is its flexibility. They allow for known changes in the structure of the system.

In the context of state-space specifications; we specify our measurement and transition equations as below. The measurement equation shows the evolution of the observed variables described as a function of the unobserved variables. The transition equation shows how the unobserved variables evolve.

Measurement equation:

$$2 = C(1)_t * MI_t + C(2)_t * ES_t + C(3)_t * KO_t$$

According to this measurement equation, we treat the trilemma regression holds exactly as predicted by the theory. By eliminating the error term from the regression in such a way, we do not need to concern about the theoretical predictions regarding the error structure.

Transition equations:

$C(1)_t = \rho_1 C(1)_{t-1} + v_t$,

$C(2)_t = \rho_2 C(2)_{t-1} + \eta_t$ and $C(3)_t = \rho_3 C(3)_{t-1} + \varepsilon_t$ where v, η, ε are assumed to drawn from zero mean and normal distribution.

Regarding the transition equations, we treat the parameters of the trilemma indices as unobserved and allow them to vary over time, evolving based on the transition of the economic state. This general representation constitutes our main Kalman filter approach (Kalman, 1960). However, as a second version

of the same representation, we follow Athans (1974) by specifying coefficients, ρ_1, ρ_2, ρ_3, all equal to one. The main characteristic of this second version is that eliminating error terms from the transition equations produces the standard OLS estimates. By keeping these error terms in the equations but restricting the coefficients to one, we expect the second version to produce estimates between OLS and first version estimates.

Next, we analyze this model by using the Kalman filter. A filter in this context is simply a term used to describe an algorithm that allows recursive estimation of unobserved, time varying parameters or variables in the system. Nevertheless, the Kalman filter is different from forecasting in that forecasts are made for the future, whereas filtering obtains estimates of unobservables for the same time period. The basic idea behind this filter is to arrive at a conditional density function of the unobservables using Bayes' Theorem together with the functional form of its relationship with observables and an equation of motion. The filter uses the current observation to predict the next period's value of unobservable and then uses the realization of the next period to update that forecast. Similarly, all available data can also be used over the forecast sample by Kalman filtering through the entire data set, called a *smoothed estimate*.

The linear Kalman filter is optimal, i.e. Minimum Mean Squared Error estimator, if the observed variable and the noise are jointly Gaussian. Additionally, as Watson (1983) argues, the Kalman filter can always provide optimal estimates whenever OLS does and is also capable of doing so even when OLS does not.

6.3 Results

Table 5 presents the contributions obtained from GMM and Kalman filter analyses. These contribution figures, on one hand, have similarities with contribution figures of previous techniques. They all agree that stabilizing exchange rate plays a crucial role for policy makers throughout the entire period although its contribution has diminished. On the other hand, contributions of GMM and Kalman filter differ from

the contributions of the previous techniques with regard to the intensity of this reduction in the contribution of exchange rate stability and how this reduction is compensated.

Starting with GMM, this approach is different from others mainly because it assigns no role for capital openness (i.e. assigns negative figures) especially in the second and third sub-periods. This is exactly opposite to what TSLS implies. Instead, the GMM approach implies that monetary independence has an increasing contribution in Turkey's macroeconomic policies. Hence, it indicates that the trade-off is between monetary independence and capital openness rather than monetary independence and exchange rate stability during 2001Q2-2010Q4. In fact, such high negative contribution figures of capital openness are suspicious, and hence the related findings of GMM are somewhat contrary to what happened in Turkey. We conjecture that more general methods such as GMM may be introducing other problems such as imprecise estimates due to instrumenting. Similarly, we experience such high negative contribution figures in the TSLS analysis which also uses instrumental variables for analyzing.

As the second alternative, Kalman filter contributions of both versions exhibit balanced trade-offs between the trilemma indices. The leading role of exchange rate stability observed in the first period declines in the next sub-periods. This decreasing tendency of exchange rate stability is compensated by mainly increasing tendency of monetary independence whereas capital openness has a stable contribution path according to the first version (shown in Figure 6). In the second version, capital openness fluctuates in a similar fashion to OLS as expected.

Hence, there are a range of estimates obtained from different techniques and they give different contribution figures. Among all these results, we would argue that the behavior of the Turkish economy is most consistent with the contributions of Kalman filter approach, in particular to the first version, which imposes fewer restrictions.

7. Macroeconomic Impacts of Trilemma Policy Configuration

In this section, we analyze how the trilemma policy configuration and its interaction with the level of reserves affect macroeconomic variables, namely growth volatility, inflation and inflation volatility. Hence, following ACI (2008), the basic model we estimate is given by:

$$y_t = \alpha_0 + \alpha_1 TLM_t + \alpha_2 TR_t + \alpha_3 (TLM_t x TR_t) + \varepsilon_t \qquad \textbf{(2)}$$

y_t is the measure for macro economic variables, TLM_t is the trilemma index, namely, *MI*, *ES*, and *KO*, included individually and TR_t is the level of international reserves (excluding gold) as a ratio to GDP. (TLM_t x TR_t) is an interaction term between the trilemma index and the level of international reserves. Regressions were estimated using two indices at a time, given the collinearity between the three trilemma indices. Additionally, we do not include any other controls given the limited degrees of freedom in the subsamples.

7.1 Findings

Results of all regressions are presented in Table 6-14. Clearly, effects of the trilemma indices examined below differ with regards to each sub-period. Besides, in several cases, it is not feasible to reach a conclusion as coefficients of the trilemma indices are insignificant and change direction. However, we can still sum up the effects of these indices for the sub-periods where they are statistically significant and robust. These results are analyzed in detail in the next subsections.

Regarding the impact of reserve accumulation, its direct effect on these economic variables is usually insignificant and somewhat mixed. On the other hand, it is common for all sub-periods that; when reserves are introduced into the regressions as interaction terms with indices, the interaction terms of the trilemma indices with the reserves-GDP ratio are of the opposite signs.[12] As we suspect that international

[12] Only in one case at Table 10, coefficients of the trilemma index and its related interaction term have same sign. However, in this case, both terms are highly insignificant.

reserves may complement or substitute for other policy stances, we are particularly interested in the effect of those interaction terms. Thus, we can conclude for Turkey that *the reserve accumulation relaxes the impact of the Turkish trilemma policy stance for all macroeconomic variables***.** Besides, adding the interaction terms to our regressions, has impacts on the effects of the trilemma indices either by changing their direction or statistically losing their power.

Growth Volatility:

Outcomes of our analysis for growth volatility are demonstrated in Table 6, 7 and 8 for each sub-period. Starting with the period of 1998Q1-2001Q1, we obtain the most significant results in the middle section of Table 6 where we regress growth volatility on the ES and KO indices. In this section, the adjusted R square statistics ranges from 40 percent to 55 percent. Table 6 indicates that ES index is highly significant with a diminishing effect on growth volatility. Other trilemma indices, namely KO and MI indices are statistically insignificant in this time span.[13]

For the period of 2001Q2-2006Q2, none of the trilemma indices seem to matter for the volatility of growth whereas the adjusted R square takes negative values in most cases. The only significant variable (except the intercept) in these tables is the ratio of reserves to GDP having a positive sign as shown in Table 7. This result implies a positive association between reserves and growth volatility for this period.

For 2006Q3-2010Q4, most significant results are obtained in the last section of Table 8 where we regress growth volatility on the MI and KO indices. Both KO and MI indices have significant lowering effects on growth volatility whereas the effect of former index is stronger. Likewise, the ES index is weakly but again negatively associated with growth volatility, as shown in other sections of the same table.

[13] Excluding the case where KO index is significant and has a negative effect on growth volatility. However, this negative effect fades away in other cases.

Change in Inflation:

Table 9, 10 and 11 present regression results of inflation in which change in inflation is employed as a dependent variable. This is mainly due to the stationary problems of inflation data.[14] In the period of 1998Q1-2001Q1 and 2001Q2-2006Q2; all indices have insignificant effects on inflation change and adjusted R square statistics are mostly negative as shown in Table 9 and 10.

Among all three trilemma indices, the ES index having no significant effects on the change of inflation is critical as this result implies that the disinflation program based on exchange rate stabilization implemented in the period of 1998Q1-2001Q1 has in fact no significant contribution[15].

On the other hand, the ES index becomes highly significant during 2006Q3-2010Q4 with a negative effect on the change of inflation. Similarly, the MI index also gains a significant and negative role while KO index remains to be insignificant in the same period. Regression outcomes of this period are provided in Table 11.

Inflation Volatility:

Results regarding regressions employing inflation volatility as a dependent variable are reported in Table 12, 13 and 14. For the first period of 1998Q1-2001Q1, significant results are attained only in the sections where KO index is employed. These results indicate that KO index has an increasing effect on inflation volatility. Effect of ES index on inflation volatility is again insignificant although it appears to have a negative effect. This slight and insignificant effect of ES index on inflation volatility is consistent with the earlier result of the same index having insignificant influence on the change of inflation. The patterns with respect to monetary independence are also highly insignificant.

[14] All variables are tested for stationary with both ADF and KPSS techniques except the indices taking values between zero and one. Inflation series is the only variable found to be non-stationary at the level.

[15] When same regression is performed with the level of inflation (hence, neglecting the stationary issues), ES index becomes highly significant.

During 2001Q2-2006Q2, the effect of the KO index on inflation volatility interchanges from the previous period. It acquires a diminishing impact on inflation volatility in this period. Additionally, the MI and ES indices become significant during this period with negative and positive effects respectively on inflation volatility. Results for this period are shown in Table 13.

Lastly, Table 14 presents the findings of the regressions for the last period of 2006Q3-2010Q4. As the table indicates, the most significant variable for the term is reserves to GDP ratio. This variable has a positive impact on inflation volatility in this period. Apart from reserves, capital openness is the most noteworthy trilemma index among others taking somewhat significant values. Similar to the second period, this index has a declining effect on inflation volatility but it is stronger in this period[16]. Thus, effect of KO index on inflation volatility turns negative in 2001 Q2-2010Q4 while it was positive in the period of 1998Q1 -2001Q1.

8 Conclusion

In this paper we investigate Turkey's macroeconomic policies of the last two decades in the context of trilemma trade-offs. In this investigation, we also try to get an answer to the question whether there is a role for accumulating international reserves for Turkey. In line with this aim, we start with searching the point Turkey stands with respect to the trilemma triangle.

Our methodology starts with following ACI (2008) approach. Using quarterly data from 1998Q1 to 2010Q4, we construct trilemma indices for each of the three policy objectives: monetary independence, exchange rate stability and capital account openness. Considering Turkish macroeconomic policies, we split the whole period into three sub-periods to explore: 1998Q1-2001Q1, 2001Q2-2006Q2 and 2006Q3 - 2010Q4.

[16] When regressed with the interaction term, the coefficient of MI index becomes positive whereas the coefficient of interaction term is negative. Yet, the net effect is still negative.

Next, we employ different regression techniques (TSLS, GMM, Kalman filtering and adding higher power terms into the regressions) to examine trilemma trade-offs in addition to ACI approach of OLS estimation. At first cut, the results of our empirical analysis indicate that trilemma trade-offs are binding for Turkey and Turkish macroeconomic policies have been in a transformation with respect to trilemma trade-offs in particular from 1998Q1-2001Q1 to 2001Q2-2006Q2. The most remarkable change is the decrease of exchange rate stability contribution although it dominates others in the trilemma configuration throughout the entire period. Naturally, this reduction on exchange rate stability was accompanied by increases in other two indices, namely monetary policy independence and capital openness. Thus, monetary policy independence and capital openness become a part of the Turkish macroeconomic policies starting from 2001Q2-2006Q2.

Nevertheless, there is no consensus among different techniques with regard to how monetary policy independence and capital openness contribute to the economy in the later periods. While TSLS favors capital openness and attributes all the compensation to this index, GMM does the same for monetary independence. OLS and Kalman filter exhibit balanced increases in these two indices. Regarding the specifications that employ higher power terms of indices, the decrease in exchange rate stability is so limited that neither capital openness nor monetary independence demonstrates significant increases in the trilemma configuration. Among all, the Kalman filter approach has contribution figures that are the most consistent with the behavior of the economy. According to this approach, reduction on exchange rate stability is compensated mainly by monetary independence especially in the third sub-period. These contributions are shown in Figure 6.

We also show that this transformation among the trilemma indices has influenced the economic outcomes of growth volatility, inflation and inflation volatility. Obviously, these effects of the trilemma indices and their significance levels on economic variables differ with regards to each sub-period. Yet, one can

summarize effects of each trilemma indices on examined economic variables that are common in all sub-periods. Accordingly, monetary independence has a diminishing effect both on inflation change and inflation volatility throughout 1998-2010 while exchange rate stability has the same decreasing effect on growth volatility. Regarding capital openness, the patterns of this index are less straightforward for all economic variables as they differ from period to period.

Finally, we investigate the role played by international reserves in mitigating the intensity of the trilemma trade-offs faced by Turkey. Our examination verifies that indeed there is a significant role for international reserves in softening Turkey's trilemma trade-offs. Such reserve management not only contributes to actively managing the exchange rate and limiting its volatility but also helps to regain control over monetary policy even in the face of capital inflows.

Table 1 Direct Foreign Exchange Interventions under the Floating Exchange Rate Regime

Date	Amount Purchased	Amount Sold
July 2002		3
December 2002	16	9
May 2003	579	
June 2003	566	
July 2003	938	
September 2003	2.146	
February 2004	1.283	
May 2004		9
January 2005	1.347	
March 2005	2.361	
June 2005	2.056	
July 2005	2.366	
October 2005	3.271	
November 2005	3.164	
February 2006	5.441	
June 2006		2.105
TOTAL	**25.534**	**2.126**

Table 2 Trilemma Indices, OLS Coefficients and Contribution Estimates

		1998Q1-2001Q1	2001Q2-06Q2	2006Q3-10Q4
	MI	0.492	0.529	0.473
MEANS	**ES**	0.885	0.599	0.641
	KO	0.064	0.062	0.068
	MI	0.061	0.0592*	0.813**
COEFF.	**ES**	2.034***	2.190***	2.262***
	KO	2.596**	4.790	1.760
	MI	0.030	0.313	0.385
CONTRIB.	**ES**	1.800	1.311	1.450
	KO	0.166	0.298	0.120
Adj. R Square		**0.997**	**0.955**	**0.971**

*, **, *** denote statistical significance at 10%, 5% and 1% levels respectively.

Table 3 Contribution Estimates of OLS and TSLS

		OLS	OLS; AR(1)	TSLS	TSLS; AR(1)	TSLS; AR(1)&AR(2)
	MI	0.030	0.026	0.051	0.048	0.070
1998Q1-	**ES**	1.800	2.126	1.561	1.609	1.859
2001Q1	**KO**	0.166	0.016	0.383	0.340	0.085
	MI	0.313	0.313	-0.150	0.130	0.027
2001Q2-	**ES**	1.311	1.370	0.382	0.961	0.629
2006Q2	**KO**	0.298	0.272	1.733	0.871	1.306
	MI	0.385	0.362	0.366	0.175	0.252
2006Q3-	**ES**	1.450	1.415	1.179	-0.345	0.545
2010Q4	**KO**	0.120	0.160	0.412	2.217	1.128

Table 4 Contribution Estimates of Enhanced OLS and TSLS

		Enhanced OLS	Enhanced OLS;AR(1) errors	Enhanced TSLS	Enhanced TSLS; AR(1) errors
	MI	0.000	0.000	-0.027	-0.011
1998Q1-	**ES**	2.001	2.000	2.028	2.011
2001Q1	**KO**	-0.001	0.000	0.000	0.000
	MI	-0.115	-0.126	-0.232	-0.102
2001Q2-	**ES**	2.061	2.164	1.544	2.165
2006Q2	**KO**	0.075	-0.007	0.778	-0.035
	MI	0.051	0.044	-0.041	0.036
2006Q3-	**ES**	1.871	1.917	1.160	1.918
2010Q4	**KO**	0.071	0.026	0.864	0.030

Table 5 Contribution Estimates of GMM and Kalman Filter

		GMM	Kalman Filter 1st Version	Kalman Filter 2nd Version
	MI	0.175	-0.046	-0.097
1998Q1-	**ES**	1.515	1.611	1.981
2001Q1	**KO**	0.318	0.434	0.116
	MI	1.116	0.068	0.282
2001Q2-	**ES**	1.462	1.504	1.340
2006Q2	**KO**	-0.557	0.428	0.377
	MI	0.705	0.409	0.318
2006Q3-	**ES**	1.627	1.150	1.435
2010Q4	**KO**	-0.326	0.441	0.246

Table 6 Growth Volatility, 1998Q1-2001Q1

	(1)		(2)		(3)		(4)		(5)	
	Coefficient	*Std. Error*	*Coefficient*	*Std. Error*	*Coefficient*	*Std. Error*	*Coefficient*	*Std. Error*	*Coefficient*	*Std. Error*
Intercept	29.71***	4.83	32.00***	7.08	72.92***	10.92	73.53	117.01	67.82	93.40
MI	6.06	3.51	4.74	3.10	-76.35**	23.76	3.72	5.06	-76.76**	30.08
ES	-30.90***	5.08	-30.06***	4.91	-30.45***	4.97	-74.51	123.77	-24.69	110.04
Res/GDP			-6.72	11.58	-120.28***	34.96	-124.01	332.84	-105.85	267.52
MI*Res					228.71**	77.09			230.25*	100.60
ES*Res							127.14	358.22	-16.47	320.79
Adj. R^2	**0.41**		**0.36**		**0.48**		**0.29**		**0.41**	**0.41**
	Coefficient	*Std. Error*	*Coefficient*	*Std. Error*	*Coefficient*	*Std. Error*	*Coefficient*	*Std. Error*	*Coefficient*	*Std. Error*
Intercept	37.38***	6.48	49.61***	9.48	39.67	10.11	114.70	76.74	68.23	83.94
KO	-21.95	16.52	-37.14**	15.74	232.63	119.74	-36.85	15.94	216.26	136.66
ES	-34.62***	6.79	-39.24***	6.59	-47.21	7.39	-110.43	82.09	-77.29	88.30
Res/GDP			-20.16	14.25	29.33	28.72	-204.24	211.75	-52.73	252.03
KO*Res					-798.58	351.33			-749.74	401.45
ES*Res							201.23	228.36	86.39	264.47
Adj. R^2	**0.40**		**0.49**		**0.55**		**0.45**		**0.49**	**0.40**
	Coefficient	*Std. Error*	*Coefficient*	*Std. Error*	*Coefficient*	*Std. Error*	*Coefficient*	*Std. Error*	*Coefficient*	*Std. Error*
Intercept	3.30	3.41	7.97	13.54	14.20	23.74	47.58	25.85	74.52	44.00
KO	17.75	24.91	11.43	35.98	-74.08	326.64	4.23	40.98	-220.11	414.88
MI	1.85	5.04	-0.23	6.92	-0.86	6.79	-76.46*	35.77	-98.75*	44.74
Res/GDP			-9.10	26.03	-25.57	64.09	-117.12*	59.55	-189.20	122.61
KO*Res					241.44	979.54			627.97	1214.89
MI*Res							211.77**	89.61	269.14*	126.06
Adj. R^2	**-0.14**		**-0.24**		**-0.38**		**-0.23**		**-0.32**	**-0.14**

Table 7 Growth Volatility, 2001Q2-2006Q2

	(1)		(2)		(3)		(4)		(5)	
	Coefficient	*Std. Error*	*Coefficient*	*Std. Error*	*Coefficient*	*Std. Error*	*Coefficient*	*Std. Error*	*Coefficient*	*Std. Error*
Intercept	6.00***	1.16	-2.60	4.72	13.10	11.10	-1.85	9.28	10.49	14.13
MI	1.10	2.02	2.365	1.67	-25.52	20.95	2.34	1.74	-26.17	20.75
ES	-3.11	2.78	-2.29	1.90	-4.66	2.86	-3.70	22.20	0.91	20.43
Res/GDP			19.25	12.43	-18.33	27.06	17.30	23.91	-11.51	36.27
MI*Res					74.78	58.21			-14.83	54.72
ES*Res							3.70	59.21	76.77	57.22
Adj. R^2	**-0.06**		**0.00**		**0.00**		**-0.06**		**-0.07**	**-0.06**
	Coefficient	*Std. Error*	*Coefficient*	*Std. Error*	*Coefficient*	*Std .Error*	*Coefficient*	*Std. Error*	*Coefficient*	*Std. Error*
Intercept	5.37***	1.80	0.60	4.69	-3.38	12.41	3.33	8.12	0.70	12.40
KO	22.72	28.06	19.51	27.48	84.71	255.50	19.00	26.86	107.15	279.08
ES	-3.45	3.00	-2.92	2.68	-2.88	2.72	-8.22	22.40	-13.57	19.39
Res/GDP			12.04	9.78	22.18	33.49	4.89	23.02	11.41	33.69
KO*Res					-165.94	671.65			-225.66	730.01
ES*Res							14.03	57.83	28.32	47.30
Adj. R^2	**0.00**		**-0.01**		**-0.07**		**-0.07**		**-0.13**	**0.00**
	Coefficient	*Std. Error*	*Coefficient*	*Std. Error*	*Coefficient*	*Std .Error*	*Coefficient*	*Std. Error*	*Coefficient*	*Std. Error*
Intercept	3.09	1.85	-4.27	4.75	-4.12	12.73	3.52	11.98	5.76	21.17
KO	20.14	29.42	13.12	28.06	10.35	259.58	15.79	29.44	-19.16	278.48
MI	0.71	2.12	2.05	1.86	2.06	1.77	-13.71	22.53	-14.24	24.73
Res/GDP			18.35*	9.92	17.95	33.83	-2.57	31.03	-8.50	56.65
KO*Res					6.97	693.73			88.29	739.58
MI*Res							42.21	60.70	44.01	67.71
Adj. R^2	**-0.04**		**0.00**		**-0.06**		**-0.04**		**-0.10**	

Table 8 Growth Volatility, 2006Q3-2010Q4

	(1)		(2)		(3)		(4)		(5)	
	Coefficients	*Std. Error*	*Coefficients*	*Std. Error*	*Coefficients*	*Std. Error*	*Coefficients*	*Std. Error*	*Coefficients*	*Std. Error*
Intercept	11.69***	2.91	11.82***	4.84	24.04	22.50	34.23	25.87	45.99	31.42
MI	-3.42	2.24	-3.40	2.15	-24.70	33.35	-3.71	2.47	-24.66	32.67
ES	-7.43*	4.11	-7.39	4.57	-7.72	4.89	-43.00	40.66	-42.94	41.03
Res/GDP			-0.42	10.93	-29.42	53.54	-56.83	70.44	-84.73	81.17
MI*Res					51.08	77.68			50.22	75.60
ES*Res							89.72	111.04	88.74	112.86
Adj. R^2	**0.00**		**-0.09**		**-0.19**		**-0.18**		**-0.29**	
	Coefficients	*Std. Error*	*Coefficients*	*Std. Error*	*Coefficients*	*Std. Error*	*Coefficients*	*Std. Error*	*Coefficients*	*Std. Error*
Intercept	12.62***	3.02	12.34*	6.78	56.55**	27.63	17.18	25.69	52.87*	27.12
KO	-116.51	85.29	-117.04	88.17	-854.23	488.09	-115.81	95.32	-1416.03	1289.88
ES	-0.90	5.13	-0.95	5.42	2.09	5.22	-8.67	51.69	63.11	104.32
Res/GDP			0.82	15.26	-111.78	66.26	-11.59	70.83	-101.82	65.70
KO*Res					1790.74	1091.76			3132.65	2955.21
ES*Res							19.42	128.49	-147.63	242.52
Adj. R^2	**0.14**		**0.06**		**0.03**		**-0.03**		**-0.04**	
	Coefficients	*Std. Error*	*Coefficients*	*Std. Error*	*Coefficients*	*Std. Error*	*Coefficients*	*Std. Error*	*Coefficients*	*Std. Error*
Intercept	15.89***	4.33	12.22*	5.94	50.83**	21.00	22.58	26.67	70.22	39.96
KO	-143.57**	55.07	-157.17**	58.93	-783.16**	339.95	-158.12**	61.02	-857.81**	363.81
MI	-4.85*	2.40	-5.49*	3.07	-5.54**	3.13	-23.61	40.87	-31.55	41.99
Res/GDP			11.44	18.25	-84.35	55.38	-13.50	61.39	-131.34	95.73
KO*Res					1548.68	850.52			62.41	98.60
MI*Res							43.50	95.97	1729.99*	899.20
Adj. R^2	**0.28**		**0.24**		**0.22**		**0.17**		**0.16**	

Table 9 Change in Inflation, 1998Q1-2001Q2

	(1)		(2)		(3)		(4)		(5)	
	Coefficient	*Std. Error*	*Coefficient*	*Std. Error*	*Coefficient*	*Std. Error*	*Coefficient*	*Std. Error*	*Coefficient*	*Std. Error*
Intercept	-14.16	28.07	-33.44	32.68	-15.97	49.95	-272.77	331.01	-279.84	366.11
MI	0.89	11.48	11.527	11.10	-24.62	58.51	17.44	17.19	-48.85	92.22
ES	9.57	30.91	6.54	29.94	6.93	32.70	262.67	347.86	305.76	430.82
Res/GDP			47.56	29.21	-2.87	85.99	723.36	979.38	741.25	1080.73
MI*Res					103.31	176.38			192.25	304.58
ES*Res							-732.48	1051.91	-853.61	1288.47
Adj. R^2	-0.21		-0.19		-0.35		-0.29		-0.47	-0.21
	Coefficient	*Std. Error*	*Coefficient*	*Std. Error*	*Coefficient*	*Std. Error*	*Coefficient*	*Std. Error*	*Coefficient*	*Std. Error*
Intercept	-8.54	37.78	-32.58	37.78	11.71	43.79	-152.23	205.97	77.62	243.49
KO	-16.54	57.91	11.82	76.19	-1189.41**	486.81	11.55	81.51	-1227.43*	517.98
ES	4.93	40.22	14.57	44.20	50.01*	22.82	145.43	224.93	-19.40	256.49
Res/GDP			38.67	36.33	-181.70	101.48	378.04	641.30	-371.64	726.66
KO*Res					3555.96**	1292.70			3668.92**	1367.61
ES*Res							-371.21	704.01	200.11	772.24
Adj. R^2	-0.20		-0.23		0.14		-0.38		0.00	-0.20
	Coefficient	*Std. Error*	*Coefficient*	*Std. Error*	*Coefficient*	*Std. Error*	*Coefficient*	*Std. Error*	*Coefficient*	*Std. Error*
Intercept	-4.39	5.04	-31.69	19.72	31.85	38.22	-17.19	47.83	98.03	124.66
KO	-20.87	39.49	12.45	60.30	-832.15	588.74	9.33	66.44	-976.28	778.14
MI	0.97	11.60	14.21	12.22	5.91	12.90	-14.01	74.11	-104.84	151.57
Res/GDP			52.87	39.81	-113.20	102.99	12.91	122.81	-294.15	331.45
KO*Res					2390.43	1714.04			2764.16	2231.11
MI*Res							79.60	209.57	308.74	400.14
Adj. R^2	-0.20		-0.19		-0.07		-0.35		-0.18	

Table 10 Change in Inflation, 2001Q2-2006Q2

	(1)		(2)		(3)		(4)		(5)	
	Coefficient	*Standard Error*	*Coefficient*	*Standard Error*	*Coefficient*	*Standard Error*	*Coefficient*	*Standard Error*	*Coefficient*	*Standard Error*
Intercept	-2.73	5.74	19.09	19.08	48.41	46.60	-14.53	47.44	12.36	51.49
MI	-5.52	7.65	-8.71	7.76	-60.80	69.56	-7.64	7.03	-69.76	78.25
ES	7.36	10.32	5.28	8.88	0.86	8.37	67.87	97.76	77.90	108.67
Res/GDP			-48.84	42.95	-119.01	107.98	38.13	132.26	-24.64	134.84
MI*Res					139.66	173.48			167.30	202.91
ES*Res							-164.95	266.30	-205.33	298.88
Adj. R^2	**-0.05**		**-0.03**		**-0.08**		**-0.08**		**-0.12**	
	Coefficient	*Standard Error*	*Coefficient*	*Standard Error*	*Coefficient*	*Standard Error*	*Coefficient*	*Standard Error*	*Coefficient*	*Standard Error*
Intercept	-8.00	5.12	5.90	10.96	65.63	50.23	-52.54	62.62	-10.53	56.74
KO	41.32	62.87	62.87	65.52	-927.47	684.84	61.58	67.48	-1345.76*	751.13
ES	7.00	12.33	5.45	11.95	4.85	10.65	118.85	131.22	204.21	144.09
Res/GDP			-35.08	33.61	-187.26	135.97	117.65	159.76	13.56	157.82
KO*Res					2489.30	1788.56			3602.64	1957.25
ES*Res							-299.96	338.97	-528.09*	381.58
Adj. R^2	**-0.06**		**-0.08**		**-0.02**		**-0.09**		**0.08**	
	Coefficient	*Standard Error*	*Coefficient*	*Standard Error*	*Coefficient*	*Standard Error*	*Coefficient*	*Standard Error*	*Coefficient*	*Standard Error*
Intercept	-1.15	7.68	25.02	22.49	62.32	47.80	62.19	46.01	117.51*	56.51
KO	56.26	50.56	81.21	57.75	-604.16	581.32	93.97	68.24	-768.92	552.18
MI	-6.80	8.92	-11.57	9.53	-8.64	9.70	-86.76	74.38	-99.66	63.43
Res/GDP			-65.17	51.97	-163.54	124.78	-164.94	115.51	-311.20**	141.73
KO*Res					1725.78	1541.98			2179.88	1437.65
MI*Res							201.32	183.61	245.75	153.41
Adj. R^2	**-0.03**		**0.04**		**0.04**		**0.05**		**0.07**	

Table 11 Change in Inflation, 2006Q3-2010Q4

	(1)		(2)		(3)		(4)		(5)	
	Coefficient	*Std. Error*	*Coefficient*	*Std. Error*	*Coefficient*	*Std. Error*	*Coefficient*	*Std. Error*	*Coefficient*	*Std. Error*
Intercept	6.79***	1.57	9.01***	2.74	-3.97	8.27	-26.68***	5.98	-37.72***	6.61
MI	-2.66**	1.24	-2.34**	0.94	21.02	13.00	-1.76**	0.72	19.65*	9.83
ES	-8.70***	2.10	-8.12**	2.82	-7.64**	2.79	49.45***	10.70	48.50***	10.66
Res/GDP			-6.55	7.22	23.98	20.64	82.87***	15.22	108.72***	16.57
MI*Res					-55.90*	30.58			-51.28**	22.25
ES*Res							-144.51***	26.54	-141.03***	26.85
Adj. R^2	**0.39**		**0.38**		**0.38**		**0.51**		**0.52**	
	Coefficient	*Std. Error*	*Coefficient*	*Std. Error*	*Coefficient*	*Std. Error*	*Coefficient*	*Std. Error*	*Coefficient*	*Std. Error*
Intercept	4.85***	1.64	9.56***	3.17	5.48	10.67	-27.59***	8.07	-28.93***	8.27
KO	7.68	6.91	13.39	10.08	75.45	158.28	10.02	8.35	37.27	95.41
ES	-8.45***	2.84	-7.82**	3.47	-8.48**	3.77	51.78***	13.64	50.81***	15.27
Res/GDP			-13.16	8.64	-2.69	27.34	81.23***	21.46	84.73***	21.62
KO*Res					-141.91	350.89			-62.23	203.49
ES*Res							-149.82***	34.83	-148.09***	37.59
Adj. R^2	**0.29**		**0.34**		**0.30**		**0.49**		**0.45**	
	Coefficient	*Std. Error*	*Coefficient*	*Std. Error*	*Coefficient*	*Std. Error*	*Coefficient*	*Std. Error*	*Coefficient*	*Std. Error*
Intercept	0.95	0.96	6.57	3.90	16.03**	6.93	-11.24	11.84	-2.35	16.42
KO	-2.06	6.99	5.76	10.44	-128.59	74.23	2.99	10.25	-89.62	92.70
MI	-1.81	1.96	-1.10	1.56	-1.17	1.40	30.95*	17.06	26.69	18.22
Res/GDP			-15.50	10.14	-37.53**	16.88	28.01	30.07	7.05	40.58
KO*Res					309.72*	174.88			214.32	216.88
MI*Res							-77.06*	41.77	-66.92	44.05
Adj. R^2	**-0.07**		**-0.02**		**-0.04**		**0.01**		**-0.04**	**-0.07**

Table 12 Inflation Volatility, 1998Q1-2001Q1

	(1)		(2)		(3)		(4)		(5)	
	Coefficient	*Standard Error*	*Coefficient*	*Standard Error*	*Coefficient*	*Standard Error*	*Coefficient*	*Standard Error*	*Coefficient*	*Standard Error*
Intercept	20.74	11.97	28.10	17.70	12.73	18.12	305.23**	132.96	309.59	113.61
MI	-1.61	8.14	-5.82	5.41	24.64	21.41	-12.627***	3.78	48.78	42.01
ES	-17.59	14.26	-14.91	15.12	-14.76	16.73	-311.53*	143.03	-349.53	116.57
Res/GDP			-21.58	16.89	21.09	30.35	-804.27*	375.09	-818.12	315.93
MI*Res					-85.92	68.84			-175.65	117.22
ES*Res							848.43*	404.65	957.98	320.22
Adj. R^2	**-0.01**		**0.02**		**-0.08**		**0.22**		**0.21**	**-0.01**
	Coefficient	*Standard Error*	*Coefficient*	*Standard Error*	*Coefficient*	*Standard Error*	*Coefficient*	*Standard Error*	*Coefficient*	*Standard Error*
Intercept	4.06	10.18	7.46	18.35	-8.31	16.73	193.44	111.32	129.43	126.47
KO	47.60*	22.81	43.36	25.35	471.76*	224.74	44.19	25.34	392.77	233.61
ES	-3.07	10.86	-4.36	14.23	-17.02*	8.90	-207.72	123.35	-162.08	126.88
Res/GDP			-5.62	15.73	72.96	46.91	-531.49	347.94	-322.84	386.49
KO*Res					-1268.12*	646.84			-1032.53	697.80
ES*Res							574.86	381.91	416.71	388.72
Adj. R^2	**0.22**		**0.15**		**0.28**		**0.22**		**0.28**	**0.22**
	Coefficient	*Standard Error*	*Coefficient*	*Standard Error*	*Coefficient*	*Standard Error*	*Coefficient*	*Standard Error*	*Coefficient*	*Standard Error*
Intercept	1.53	4.46	5.37	12.30	-17.77	21.96	-26.51	20.74	-82.88	46.89
KO	50.36*	24.74	45.14	29.58	362.74	240.11	50.94	29.94	520.39**	204.16
MI	-0.74	5.92	-2.46	9.14	-0.12	10.20	58.91	32.47	105.55	60.16
Res/GDP			-7.51	20.49	53.65	50.61	79.45	47.09	230.30*	115.34
KO*Res					-896.82	654.59			-1314.10**	532.68
MI*Res							-170.49*	87.43	-290.55*	151.56
Adj. R^2	**0.22**		**0.15**		**0.19**		**0.12**		**0.31**	**0.22**

Table 13 Inflation Volatility, 2001Q2-2006Q2

	(1)		(2)		(3)		(4)		(5)	
	Coefficient	*Standard Error*	*Coefficient*	*Standard Error*	*Coefficient*	*Standard Error*	*Coefficient*	*Standard Error*	*Coefficient*	*Standard Error*
Intercept	0.53	1.94	-3.40	6.58	9.00	11.23	17.34	19.12	24.88	21.40
MI	-3.85***	1.08	-3.273***	1.08	-25.31	15.88	-3.94***	0.82	-21.36	21.71
ES	7.23*	4.02	7.60*	4.38	5.73	4.63	-31.01	43.68	-28.20	45.11
Res/GDP			8.80	13.62	-20.89	26.02	-44.86	53.46	-62.46	59.22
MI*Res					59.08	43.24			46.91	59.68
ES*Res							101.77	123.41	90.44	129.36
Adj. R^2	**0.15**		**0.11**		**0.08**		**0.10**		**0.06**	**0.15**
	Coefficient	*Standard Error*	*Coefficient*	*Standard Error*	*Coefficient*	*Standard Error*	*Coefficient*	*Standard Error*	*Coefficient*	*Standard Error*
Intercept	-0.58	2.34	-7.87	5.62	-13.06	8.92	7.67	20.21	2.49	19.92
KO	-18.50	12.09	-23.41**	10.58	61.62	106.85	-26.30**	11.43	147.06	151.18
ES	7.59*	4.01	8.40*	4.13	8.46*	4.25	-21.74	43.67	-32.26	52.07
Res/GDP			18.41	12.10	31.64	21.87	-22.20	58.15	-9.38	57.81
KO*Res					-216.40	271.00			-443.79	379.43
ES*Res							79.75	124.11	107.86	146.52
Adj. R^2	**0.06**		**0.09**		**0.04**		**0.06**		**0.02**	
	Coefficient	*Standard Error*	*Coefficient*	*Standard Error*	*Coefficient*	*Standard Error*	*Coefficient*	*Standard Error*	*Coefficient*	*Standard Error*
Intercept	5.35***	0.90	2.74	5.32	-9.25	8.03	22.64**	9.71	13.26	10.78
KO	-8.87	16.54	-11.35	14.99	209.02*	102.01	-4.52	11.26	141.83*	81.04
MI	-3.74**	1.58	-3.26**	1.48	-4.21**	1.79	-43.51**	19.26	-41.32**	20.05
Res/GDP			6.48	13.77	38.11*	21.48	-46.91*	24.68	-22.10	27.50
KO*Res					-554.89**	246.33			-369.72*	207.84
MI*Res							107.75**	52.26	100.21*	54.18
Adj. R^2	**0.02**		**-0.03**		**-0.06**		**0.02**		**-0.03**	

Table 14 Inflation Volatility, 2006Q3-2010Q4

	(1)		(2)		(3)		(4)		(5)	
	Coefficients	*Standard Error*	*Coefficients*	*Standard Error*	*Coefficients*	*Standard Error*	*Coefficients*	*Standard Error*	*Coefficients*	*Standard Error*
Intercept	1.27**	0.59	-0.25	1.09	-4.96*	2.51	1.80	4.46	-2.64	5.65
MI	-0.07	0.48	-0.29	0.59	8.19*	4.61	-0.33	0.63	8.29	4.68
ES	-0.35	0.81	-0.75	0.87	-0.58	0.77	-4.07	7.40	-4.45	6.74
Res/GDP			4.50	3.35	15.58**	6.38	-0.65	11.85	9.75	14.56
MI*Res					-20.31*	10.98			-20.63*	11.04
ES*Res							8.32	18.89	9.72	17.40
Adj. R^2	**-0.13**		**-0.09**		**-0.10**		**-0.17**		**-0.19**	**-0.13**
	Coefficients	*Standard Error*	*Coefficients*	*Standard Error*	*Coefficients*	*Standard Error*	*Coefficients*	*Standard Error*	*Coefficients*	*Standard Error*
Intercept	1.40**	0.52	-0.88	0.85	0.26	2.67	-1.59	4.28	-0.67	4.41
KO	-6.26**	2.73	-9.02**	3.12	-26.28	35.69	-9.08***	3.02	-27.32	39.95
ES	0.06	0.87	-0.24	0.79	-0.06	0.93	0.90	7.28	1.55	7.70
Res/GDP			6.34***	1.75	3.43	6.60	8.14	11.68	5.80	11.92
KO*Res					39.49	77.91			41.65	87.67
ES*Res							-2.87	19.82	-4.02	20.34
Adj. R^2	**0.01**		**0.16**		**0.10**		**0.10**		**0.03**	
	Coefficients	*Standard Error*	*Coefficients*	*Standard Error*	*Coefficients*	*Standard Error*	*Coefficients*	*Standard Error*	*Coefficients*	*Standard Error*
Intercept	1.48***	0.34	-0.98	0.73	0.40	2.36	-7.91***	2.19	-7.79**	2.94
KO	-6.23**	2.60	-9.66***	2.49	-29.34	29.38	-10.74***	2.30	-11.97	25.74
MI	-0.09	0.52	-0.40	0.59	-0.41	0.59	12.06**	4.39	12.00**	4.49
Res/GDP			6.80***	1.69	3.57	5.32	23.71***	5.55	23.44***	6.90
KO*Res					45.37	65.35			2.85	55.69
MI*Res							-29.96**	10.86	-29.83**	11.05
Adj. R^2	**0.01**		**0.18**		**0.13**		**0.27**		**0.21**	

Figure 1 The Trilemma Framework

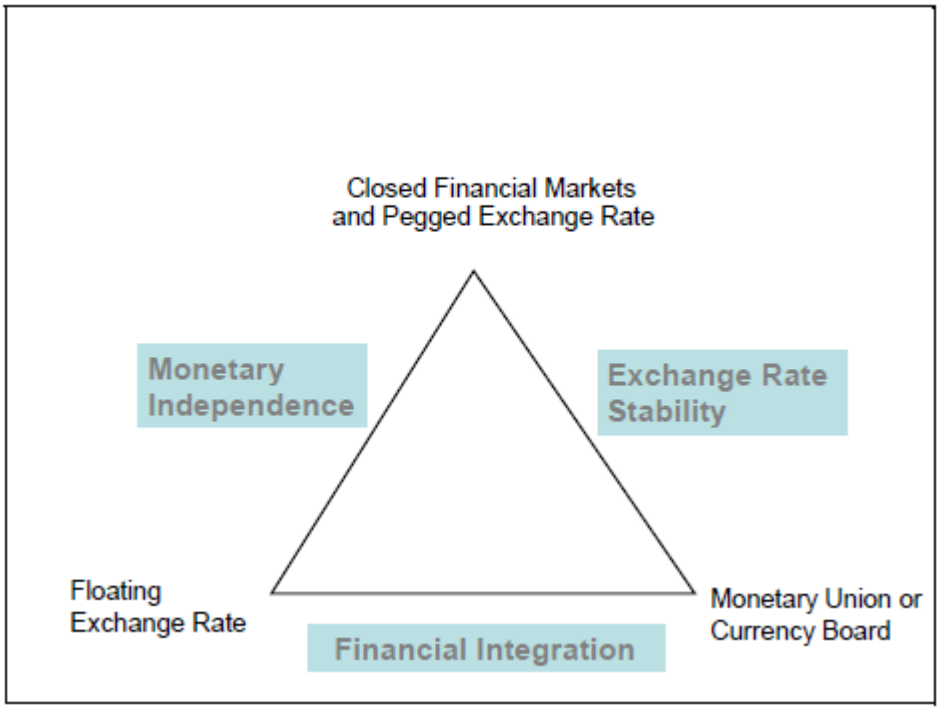


Figure 2 Reserves-GDP Ratio

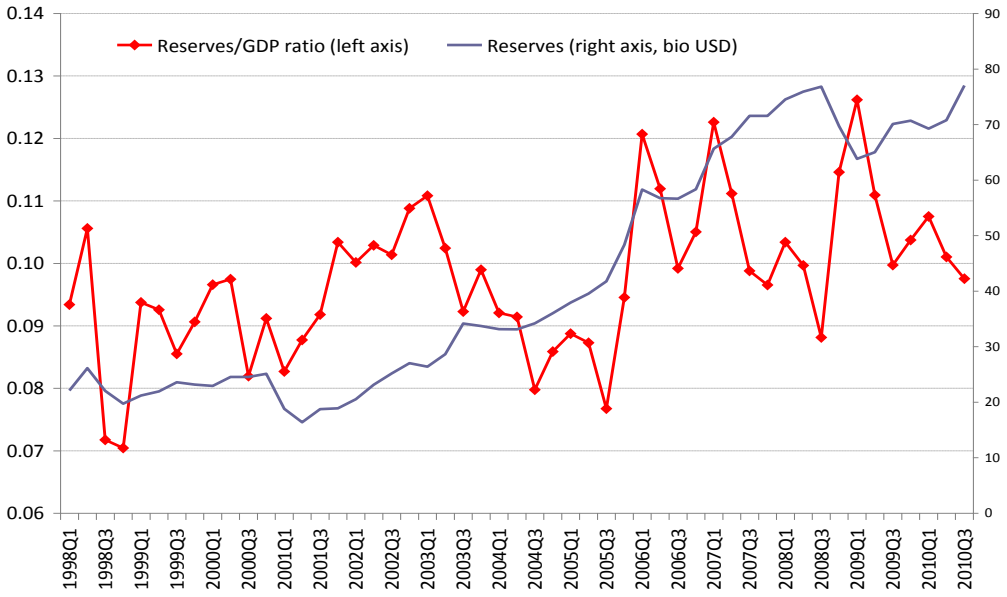


Figure 3 Exchange Rate Stability (ES) Index

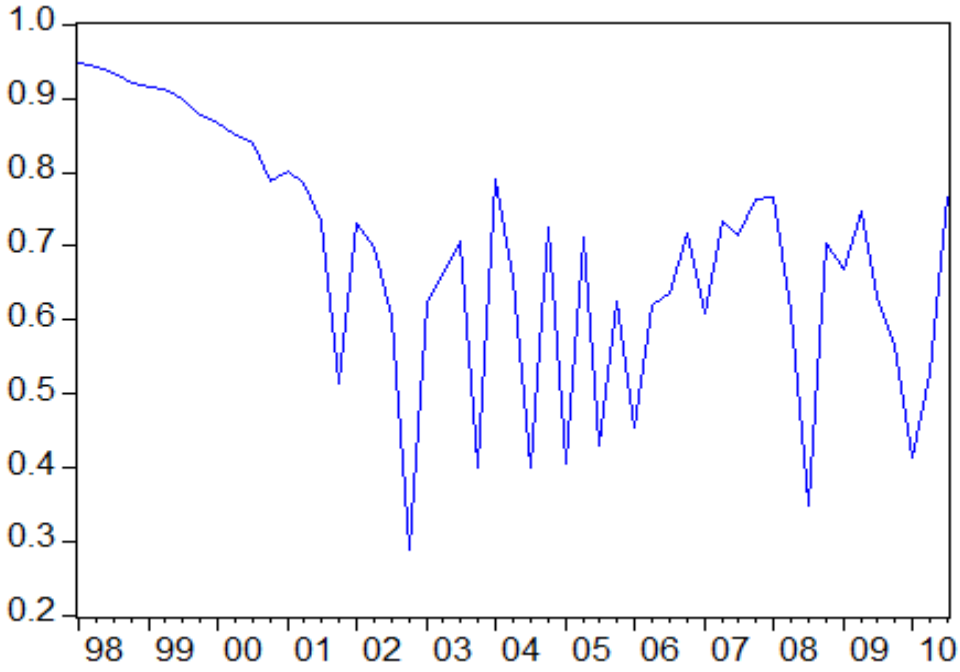


Figure 4 Capital Openness (KO) Index

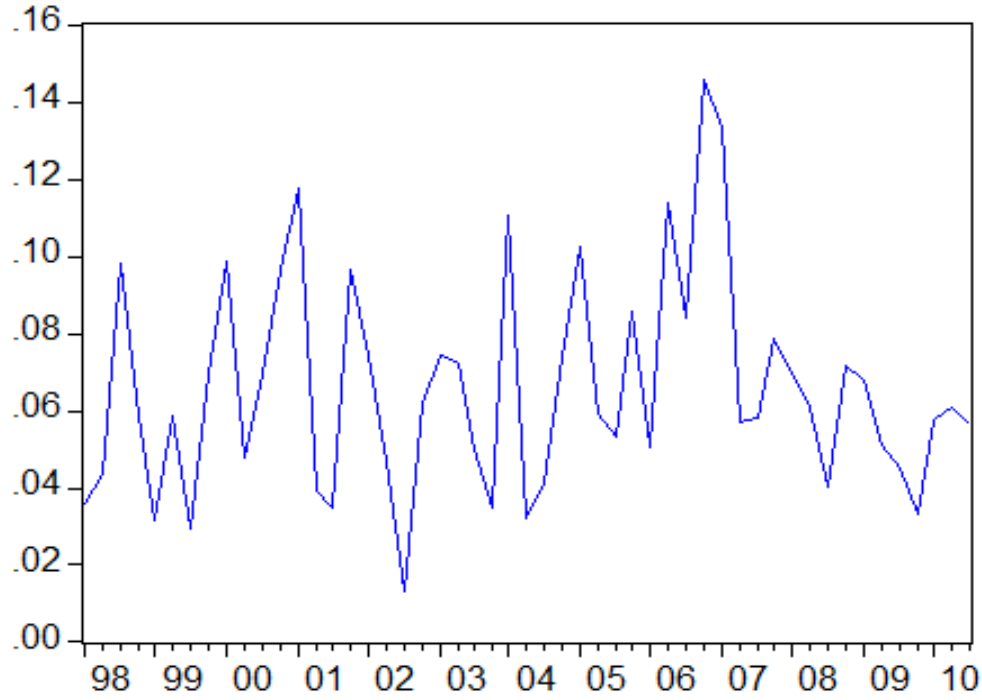


Figure 5 Monetary Independence (MI) Index

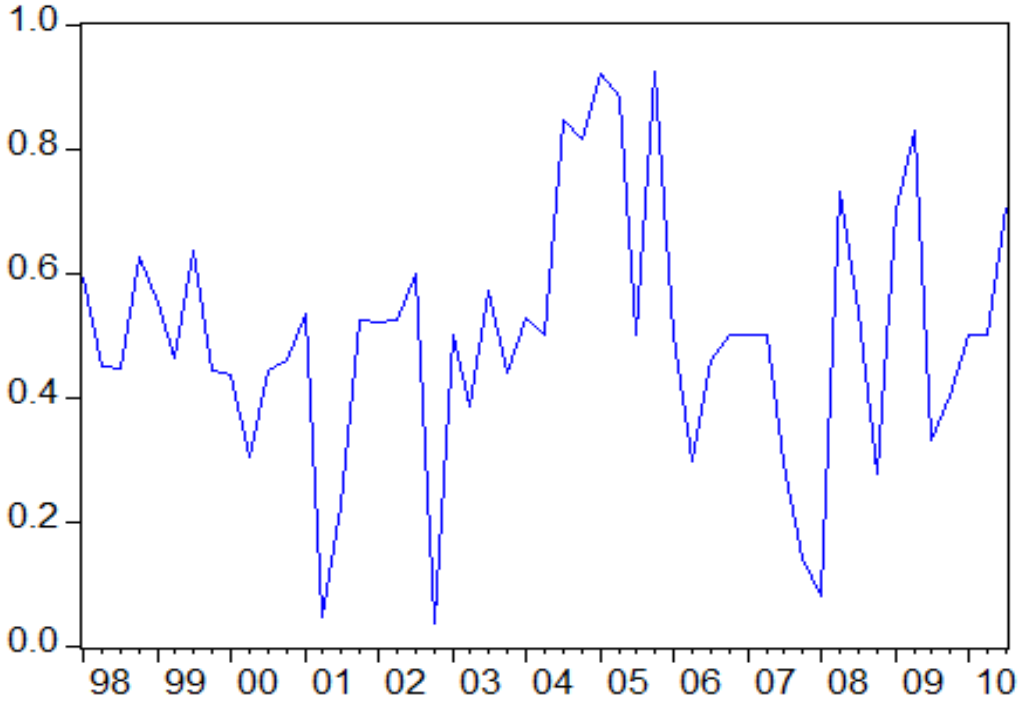
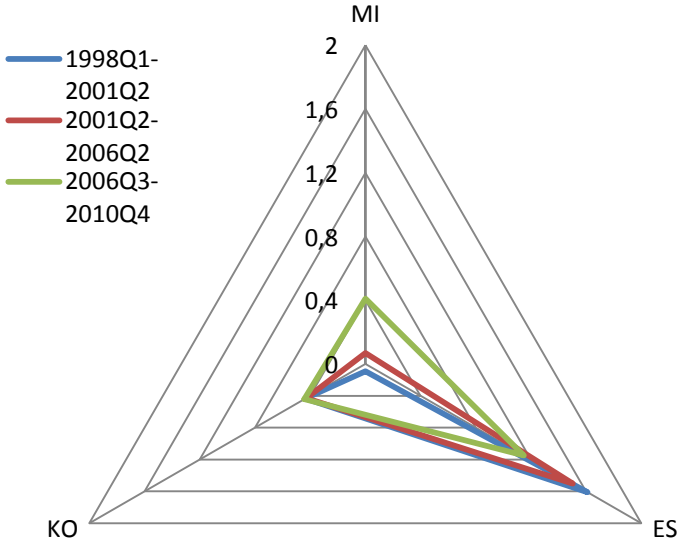


Figure 6 Contributions According to Kalman Filter Approach (1st version)



APPENDIX: Data Sources

Turkish data obtained from the CBRT website, available at the address: *http://evds.tcmb.gov.tr/yeni/cbt-uk.html*

US data obtained from the Federal Reserve System database, available at: *http://research.stlouisfed.org/fred2/categories*

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